

**QUALITY ASSURANCE PROJECT PLAN
FOR A SITE REASSESSMENT
ATLANTIC WATER SUPPLY SITE
ATLANTIC, IOWA**

CERCLIS ID: IAD039954300

**Superfund Technical Assessment and Response Team (START) 3 Contract
Contract No. EP-S7-06-01, Task Order 0258**

Prepared For:

U.S. Environmental Protection Agency
Region 7
Superfund Division
901 North 5th Street
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October 25, 2011

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Superfund

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Region 7 Superfund Program
Addendum for the Generic QAPP for Superfund Site Assessment and Targeted Brownfields Assessment Activities (July 2007)
for the Atlantic Water Supply Site

Project Information:

Site Name: Atlantic Water Supply Site		City: Atlantic	State: Iowa
EPA Project Manager: Ron King		START Project Manager: David Zimmermann	
Approved By: <i>[Signature]</i>	Title: START Project Manager	Date: 10/25/11	Prepared For: EPA Region 7 Superfund Division
Approved By: <i>[Signature]</i>	Title: START Program Manager	Date: 10/25/11	
Approved By: <i>[Signature]</i>	Title: START QA Manager	Date: 10/25/2011	Prepared By: David Zimmermann
Approved By: <i>[Signature]</i>	Title: EPA Project Manager	Date: 10/27/2011	Date: October 2011
Approved By: <i>[Signature]</i>	Title: EPA Region 7 QA Manager	Date: 11/09/2011	Tetra Tech START Project Number: X9004 11.0258.000

1.0 Project Management:

1.1 Distribution List

EPA—Region 7: Ron King, EPA Site Assessment Manager
 Diane Harris, Region 7 QA Manager

START: David Zimmermann, Project Manager

1.2 Project/Task Organization

Ron King, of the EPA Region 7 Superfund Division, will serve as the EPA Project Manager for the activities described in this QAPP. David Zimmermann, of Tetra Tech EM Inc., (Tetra Tech), will serve as the START Project Manager.

1.3 Problem Definition/Background:

Description: This site-specific Quality Assurance Project Plan form is prepared as an addendum to the Generic Quality Assurance Project Plan for Superfund Site Assessment and Targeted Brownfields Assessment Programs (updated July 2007), and contains site-specific data quality objectives for the sampling activities described herein.

☒ Description attached.

☐ Description in referenced report: _____
 Title _____ Date _____

1.4 Project/Task Description:

☐ CERCLA PA ☐ CERCLA SI ☐ Brownfields Assessment
☒ Other (description attached): ☐ Pre-CERCLIS Site Screening ☐ Removal Assessment

Schedule. Field work is anticipated to occur in November 2011.

☐ Description in referenced report: _____
 Title _____ Date _____

1.5 Quality Objectives and Criteria for Measurement Data:

Accuracy:	<input checked="" type="checkbox"/> Identified in attached table.
Precision:	<input checked="" type="checkbox"/> Identified in attached table.
Representativeness:	<input checked="" type="checkbox"/> Identified in attached table.
Completeness*:	<input checked="" type="checkbox"/> Identified in attached table.
Comparability:	<input checked="" type="checkbox"/> Identified in attached table.

Other Description:

*A completeness goal of 100 percent has been established for this project. However, if the completeness goal is not met, EPA may still be able to make site decisions based on any or all of the remaining validated data.

1.6 Special Training/Certification Requirements:

☒ OSHA 1910
☐ Special Equipment/Instrument Operator:
☐ Other (describe below):

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1.7 Documentation and Records:

- ☒ Field Sheets ☒ Site Log ☐ Trip Report ☒ Site Maps ☐ Video
☒ Chain of Custody ☒ Health and Safety Plan ☒ Letter Report ☒ Photos
- ☒ Sample documentation will follow EPA Region 7 SOP 2420.05.
- ☒ Other: Analytical information will be handled according to procedures identified in Table 2.

2.0 Measurement and Data Acquisition:

2.1 Sampling Process Design:

- ☐ Random Sampling ☐ Transect Sampling ☒ Biased/Judgmental Sampling ☐ Stratified Random Sampling
☐ Search Sampling ☐ Systematic Grid ☐ Systematic Random Sampling ☒ Definitive Sampling
☐ Screening w/o Definitive Confirmation ☐ Screening w/ Definitive Confirmation
- ☒ Sample Map Attached

The proposed sampling scheme for groundwater collection will be biased/judgmental with definitive laboratory analysis, in accordance with procedures included in the *Guidance for Performing Site Inspections Under CERCLA*, OSWER Directive #9345.1-05, September 1992, and *Removal Program Representative Sampling Guidance, Volume 1: Soil*, OSWER Directive 9360.4-10, November 1991. All samples will be submitted for analysis by the EPA Region 7 laboratory. See Appendices A and B for additional site-specific information and maps. The proposed number of samples is a balance between cost and coverage, and represents a reasonable attempt to meet the study objectives while staying within the budget constraints of typical removal support activities.

Sample Summary Location	Matrix	# of Samples*	Analysis
Existing monitoring wells	Water	3	VOCs
Existing municipal supply wells	Water	10	VOCs at drinking water levels

*NOTE: Background/QC samples are not included with these totals. See Table 1 for a complete sample summary

2.2 Sample Methods Requirements:

Matrix	Sampling Method	EPA SOP(s)/Methods
Water	Three existing monitoring wells will be sampled using a submersible pump	EPA SOP 4231.2007
Water	10 Municipal wells will be sampled at the well head	EPA SOP 4230.10

2.3 Sample Handling and Custody Requirements:

- ☒ Samples will be packaged and preserved in accordance with procedures defined in Region 7 EPA SOP 2420.06.
☒ COC will be maintained as directed by Region 7 EPA SOP 2420.04.
☒ Samples will be accepted according to Region 7 EPA SOP 2420.01.
☐ Other (Describe):

2.4 Analytical Methods Requirements:

- ☒ Identified in attached table.
☒ Rationale: The requested analyses have been selected based on the historical information on the site and program experience with similar types of sites.
☐ Other (Describe):

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2.5 Quality Control Requirements:

- ☐ Not Applicable
- ☒ Identified in attached table.
- ☒ In accordance with the Generic Quality Assurance Project Plan for Superfund Site Assessment and Targeted Brownfields Assessment Programs (updated July 2007).
- ☒ Describe Field QC Samples: For this investigation, field QC samples will include one field blank (water) and one equipment rinsate blank (water), both prepared with deionized (DI) water provided by the EPA Region 7 laboratory. The field blank will be collected to evaluate contamination of sampling containers and/or preservatives and to assess contamination potentially introduced during the sampling and laboratory procedure(s). The equipment rinsate will evaluate the effectiveness of decontamination procedures for monitoring well sampling equipment. In addition, one water trip blank will be prepared by the EPA Region 7 laboratory and be used to evaluate contamination introduced during transportation of the containers/samples. Two field duplicates will be required, one from Monitoring Well 2 and one from Atlantic Municipal Utilities Well No. 6. All QC samples will be submitted for the analyses listed in the attached tables. Evaluation of blank samples depends on the levels of contamination found in environmental samples to determine whether the environmental samples are representative. Analytical results of blank samples will be evaluated on a qualitative basis by the EPA Project Manager and EPA contractor(s) to determine a general indication of field-introduced and/or lab-introduced contamination.
- ☐ Other (Describe):

2.6 Instrument/Equipment Testing, Inspection, and Maintenance Requirements:

- ☐ Not Applicable
- ☒ In accordance with the Generic Quality Assurance Project Plan for Superfund Site Assessment and Targeted Brownfields Assessment Programs (updated July 2007).
- ☒ Other (Describe): Testing, inspection, and maintenance of field instruments (water quality meter) will be performed in accordance with manufacturers' recommendations. Testing, inspection, and maintenance of analytical instrumentation will be performed in accordance with the previously referenced SOPs and/or manufacturers' recommendations.

2.7 Instrument Calibration and Frequency:

- ☐ Not Applicable
- ☒ Inspection/acceptance requirements are in accordance with the Generic Quality Assurance Project Plan for Superfund Site Assessment and Targeted Brownfields Assessment Programs (updated July 2007).
- ☒ Calibration of laboratory equipment will be performed as described in the previously referenced SOPs and/or manufacturers' recommendations.
- ☒ Other (Describe): Calibration of field instruments (water quality meter, etc.) will be performed daily, as described in the manufacturers' recommendations.

2.8 Inspection/Acceptance Requirements for Supplies and Consumables:

- ☐ Not Applicable
- ☒ In accordance with the Generic Quality Assurance Project Plan for Superfund Site Assessment and Targeted Brownfields Assessment Programs (updated July 2007).
- ☒ All sample containers will meet EPA criteria for cleaning procedures for low-level chemical analysis. Sample containers will have Level II certifications provided by the manufacturer in accordance with pre-cleaning criteria established by EPA in *Specifications and Guidelines for Obtaining Contaminant-Free Containers*.
- ☐ Other (Describe):

2.9 Data Acquisition Requirements:

- ☐ Not Applicable
- ☒ In accordance with the Generic Quality Assurance Project Plan for Superfund Site Assessment and Targeted Brownfields Assessment Programs (updated July 2007).
- ☒ Previous data/information pertaining to the site (including other analytical data, reports, photos, maps, etc., which are referenced in this QAPP) have been compiled by EPA and/or its contractor(s) from other sources. Some of that data has not been verified by EPA and/or its contractor(s); however, the information will not be used for decision-making purposes by EPA without verification by an independent professional qualified to verify such data/information.
- ☐ Other (Describe):

2.10 Data Management:

- ☒ All laboratory data acquired will be managed in accordance with Region 7 EPA SOP 2410.01.
- ☐ Other (Describe):

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3.0 Assessment and Oversight:

3.1 Assessment and Response Actions:

- ☒ Peer Review ☒ Management Review ☐ Field Audit ☐ Lab Audit
- ☒ Assessment and response actions pertaining to analytical phases of the project are addressed in Region 7 EPA SOPs 2430.06 and 2430.12.
- ☐ Other (Describe):

3.1A Corrective Action:

- ☒ Corrective actions will be taken at the discretion of the EPA Project Manager whenever there appear to be problems that could adversely affect data quality and/or resulting decisions affecting future response actions pertaining to the site.
- ☐ Other (Describe):

3.2 Reports to Management:

- ☐ Audit Report ☐ Data Validation Report ☐ Project Status Report ☐ None Required
- ☒ A letter report describing the sampling techniques, locations, problems encountered (with resolutions to those problems), and interpretation of analytical results will be prepared by Tetra Tech START and submitted to the EPA.
- ☒ Reports will be prepared in accordance with the Generic Quality Assurance Project Plan for Superfund Site Assessment and Targeted Brownfields Assessment Programs (updated July 2007).
- ☐ Other (Describe):

4.0 Data Validation and Usability:

4.1 Data Review, Validation, and Verification Requirements:

- ☐ Identified in attached table:
- ☒ Data review and verification will be performed in accordance with the Generic Quality Assurance Project Plan for Superfund Site Assessment and Targeted Brownfields Assessment Programs (updated July 2007).
- ☒ Data review and verification will be performed by a qualified analyst and the laboratory's section manager as described in Region 7 EPA SOPs 2430.06, 2410.10, and 2430.12.
- ☐ Other (Describe):

4.2 Validation and Verification Methods:

☐ Identified in attached table.

- ☐ Identified in attached table:
- ☒ The data will be validated in accordance with Region 7 EPA SOPs 2430.06, 2410.10, and 2430.12.
- ☒ The EPA Project Manager will inspect the data to provide a final review. The EPA Project Manager will review the data, if applicable, for laboratory spikes and duplicates; and laboratory blanks to ensure that they are acceptable. The EPA Project Manager will also compare the sample descriptions with the field sheets for consistency and will ensure that any anomalies in the data are appropriately documented.
- ☐ Other (Describe):

4.3 Reconciliation with User Requirements:

- ☐ Identified in attached table:
- ☒ If data quality indicators do not meet the project's requirements as outlined in this QAPP, the data may be discarded and re-sampling or re-analysis of the subject samples may be required by the EPA Project Manager
- ☐ Other (Describe):

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Table 1: Sample Summary

Site Name: Atlantic Water Supply Site				Location: Atlantic, Iowa			
START Project Manager: David Zimmermann				Activity/ASR #: To be determined		Date: October 2011	
No. of Samples	Matrix	Location	Purpose	Depth or other Descriptor	Requested Analysis	Sampling Method	Analytical Method/SOP
3	Water	3 monitoring wells	To verify and document current water quality of groundwater near the source area.	Wells are screened at about 35 to 50 feet below ground surface	VOCs	EPA SOP 4231.2007	EPA SOP 3230.13
10	Water	10 municipal wells	To verify and document current water quality of groundwater at the production wells.	Municipal wells are completed in upper sandstone unit and average 87 feet in depth.	VOCs at drinking water levels	EPA SOP 4230.10	EPA SOP 3230.09
QC Samples							
1	Water	Trip blank	To assess field/transportation-related contamination	NA	VOCs	NA	EPA SOP 3230.09
1	Water	Field blank	To assess field-introduced and laboratory-introduced contamination	NA	VOCs	NA	EPA SOP 3230.09
1	Water	Duplicate	To assess sample variability in the matrix and assess sampling precision	One from monitoring well 2	VOCs	EPA SOP 4231.2007	EPA SOP 3230.13
1	Water	Duplicate	To assess sample variability in the matrix and assess sampling precision	One from AMU well 6	VOCs at drinking water levels	EPA SOP 4230.10	EPA SOP 3230.09
1	Water	Rinsate blank	To evaluate effectiveness of decontamination procedures for sampling equipment	From monitoring well sampling equipment	VOCs	NA	EPA SOP 3230.013

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Table 2: Data Quality Objective Summary

Site Name: Atlantic Water Supply Site				Location: Atlantic, Iowa				
START Project Manager: David Zimmermann				Activity/ASR #: To be determined			Date: October 2011	
Analysis	Analytical Method	Data Quality Measurements					Sample Handling Procedures	Data Management Procedures
		Accuracy	Precision	Representativeness	Completeness	Comparability		
GROUNDWATER								
VOCs	see Table 1	per analytical method	per analytical method	judgmental sampling based on professional judgment of the sampling team	100%; samples of on-site soil are critical samples	Standardized procedures for sample collection and analysis will be used.	See Section 2.3 of QAPP form.	See Section 2.10 of QAPP form.

APPENDIX A

SITE-SPECIFIC INFORMATION FOR A SITE REASSESSMENT AT THE ATLANTIC WATER SUPPLY SITE

INTRODUCTION

The Tetra Tech EM Inc. (Tetra Tech) Superfund Technical Assessment and Response Team (START) has been tasked by the U.S. Environmental Protection Agency (EPA) Region 7 Superfund Division to conduct Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) site reassessment activities at the Atlantic Water Supply site in Cass County, Iowa. The site includes a chlorinated solvent groundwater contamination plume that appears to be originating from an abandoned drycleaners and has impacted a number of Atlantic, Iowa, municipal wells. The site was initially investigated by the pre-remedial program in the late 1980s. Since that time, the site has undergone a number of follow-up investigations, including a removal assessment in the mid-1990s that involved (1) delineation of the source of contamination and (2) installation and sampling of three monitoring wells. Additional information about previous investigations is presented below.

As specified by the task order and subsequent conversations with the task monitor, the site reassessment will (1) evaluate the condition of existing monitoring wells at the site, and then sample them if they are in good condition; (2) evaluate Atlantic Municipal Utilities (AMU) Well No. 7 to determine its effectiveness in containing a groundwater plume, and evaluate any need for repairs of that well; (3) assess need for any removal actions at the site; and (4) sample the existing wells in the Atlantic municipal well field. Following receipt of the sample data, the site will be reassessed using the current version of the Hazard Ranking System. This Quality Assurance Project Plan (QAPP) identifies site-specific features and addresses elements of the sampling strategy and analytical methods proposed for this investigation.

SITE LOCATION/DESCRIPTION

Atlantic, Iowa, is a rural community in the northeastern portion of Cass County, located about 75 miles west of Des Moines, Iowa, and 45 miles northeast of Council Bluffs, Iowa. The apparent source of contamination at the Atlantic Water Supply site is located at 1205 East 7th Street, also known as US Highway 6 and State Highway 83 (see Appendix B, Figure 1). A former dry cleaning facility, the Norge Dry Cleaning Village, operated at this location during the 1960s. The approximate coordinates of the former dry cleaner are latitude 41.403718° north and longitude 94.995763° west. Though the exact dates of operation are not known, the dry cleaning facility was listed in the 1962 Atlantic City Directory (Atlantic, Iowa 1962). This facility also was used from 1960 to 1974 by Shrauger Appliance as an appliance retailing facility. In 1974, the Iowa Department of Transportation (IDOT) leased the site as a materials testing laboratory. IDOT relocated its operation in March 1986 to a site east of the City. It is

suspected that the dry cleaning operations and IDOT routinely used solvents (Ecology & Environment, Inc. [E&E] 1988).

Based on the historical aerial photographs of the site (Historical Information Gatherers [HIG] 2003), the building that housed the former dry cleaner/IDOT laboratory facility was razed between 1982 and 1994. The area is now owned by the Rolling Hills Bank and Trust. A Burger King Restaurant is located about 300 feet east of the former dry cleaning location. Land use surrounding the site is a mix of commercial and residential properties. The City of Atlantic's municipal well field is located approximately 0.50 mile northwest of the former dry cleaner location.

The municipal water supply well field in Atlantic, Iowa, has been impacted by tetrachloroethene (also known as perchloroethylene or PCE) (Terra Tech 2004). At the source, approximately 40 feet of silt and clay overlies fine- to coarse-grained friable sandstone from which the well field withdraws the City's potable water supply. The silt and clay soils have been contaminated with PCE at depths too deep for physical removal and/or conventional remediation.

At present, the PCE contamination continues to migrate downward into the sandstone aquifer, and then travels horizontally within this aquifer to the City's municipal well field. The well nearest to the source area (AMU Well No. 7) was first found to contain PCE in 1982 (reported at a concentration of 170 micrograms per liter [$\mu\text{g/L}$]) (E&E 1988). AMU Well No. 7 was disconnected from the system and is presently being pumped continually by the local water authority wastewater treatment plant in order to provide hydraulic control and protect nine other municipal wells from contamination. Currently, nine active municipal serve the 7,200 citizens of Atlantic, Iowa. Eight municipal wells (AMU Well Nos. 10 through 17) are located on the north side of Troublesome Creek between 0.5 and 1 mile from the former drycleaner site (Figure 2, Appendix B). AMU Well Nos. 6 and 7 are located on the south side of the creek. For the nine active municipal wells, total depths range from approximately 75 to 98 feet below ground surface (bgs), with an average of 87 feet bgs (AMU well data). Other wells previously present on the south side of the creek (AMU Well Nos. 1 through 5 and 8 and 9) have since been decommissioned due to their age and diminishing performance. Well No. 6, located approximately 910 feet northeast of Well No. 7, is also slightly contaminated with PCE (approximately 5 $\mu\text{g/L}$ or less), which signifies the overall width of the PCE contaminant plume. The well is still used as a drinking water well and is pumped approximately 15 to 20 hours per day at 300 to 350 gallons per minute (gpm) on average. Water from the nine active municipal wells is initially blended and then treated. Prior to distribution, the water is treated primarily with liquid chlorine, used to disinfect the water, and fluorosilicic acid (H_2SiF_6), for

water fluoridation. Hydrochloric acid is additionally used for well maintenance and rehabilitation for removal of mineral scale.

PREVIOUS INVESTIGATIONS

During a water quality survey conducted by the Iowa Department of Natural Resources (IDNR) in August 1982, PCE was detected in the AMU water supply Well No. 7 at a concentration of 170 µg/L. Subsequent IDNR sampling events detected PCE in Well No. 7 at concentrations ranging from 11 µg/L in March 1995 (IDNR 1999) to 260 µg/L in August 1984 (E&E 1988). The maximum contaminant level (MCL) for PCE is 5 µg/L. From August 1982 to November 1987, water from Well No. 7 was pumped at a rate of 80 gallons per minute to Buttermilk Creek in an attempt to restrict migration of the PCE contamination to other nearby drinking water supply wells (E&E 1988). In December 1987, the discharge from Well No. 7 was rerouted to the 3rd Street sanitary sewer line about 150 feet southwest of the well for treatment at the City of Atlantic's wastewater treatment facility (E&E 1988).

In August 1987, an EPA contractor conducted a soil gas survey to delineate the approximate extent of PCE contamination. Soil-gas samples were collected from a depth of 5 to 6 feet bgs at 55 locations, beginning at the former dry cleaning and IDOT laboratory facility, and proceeding in the direction of groundwater flow (north-northwest) toward the AMU well field. Analytical results suggested the source area was just south of East 7th Street about 250 feet east of the former dry cleaning and IDOT laboratory facility (E&E 1988). The report stated that a release of PCE likely occurred at the former dry cleaning and IDOT laboratory facility, and migrated via surface runoff and groundwater flow to this topographic low near the former location of a Hardee's restaurant. According to the report, the migration of PCE from the source area may have followed the storm sewer system along the southern side of East 7th Street (E&E 1988).

In August and November 1998, IDNR conducted followup investigations of the PCE contamination to better define the source. During these investigations, 34 soil gas samples and 10 soil samples were collected for analysis. The soil samples were analyzed by IDNR for PCE by a mobile laboratory using a headspace analysis method. The sampling focused on the area of the former dry cleaning and IDOT laboratory facility, and the source area identified during the 1987 investigation by E&E. Soil gas data from the IDNR investigations confirmed the level of PCE contamination originally detected near the former Hardee's restaurant. However, significantly higher PCE levels (greater than 10,000 parts per million) were detected near the former dry cleaning and IDOT laboratory facility. Based on these findings, IDNR concluded that the silty clayey soil beneath the former dry cleaning and IDOT laboratory

facility is the predominant source of PCE contamination impacting the groundwater (IDNR 1999). The report indicated that soils appeared to be contaminated to a depth of at least 20 feet bgs. The report also recommended installing monitoring wells to better define the extent of PCE contamination in groundwater near the suspected source area.

From 2002 through 2004, Tetra Tech START conducted a removal site evaluation of the Atlantic Water Supply site. Field activities included advancement of 13 soil borings to depths ranging from 23 to 36 feet bgs (Tetra Tech 2004). These borings were advanced around the previously identified source area and sampled to aid in determining the extent of contamination. In addition, three permanent, flush-mounted monitoring wells were installed into the Dakota sandstone formation at depths ranging from 40.5 to 50 feet bgs. These wells were installed to assess groundwater quality near the source area. In soils, PCE was reported at its highest concentrations near monitoring well (MW) 2, installed near the former drycleaner. At this location, PCE was found at concentration above the preliminary remediation goal (PRG) of 3,400 micrograms per kilogram ($\mu\text{g}/\text{kg}$) in samples collected from 19 to 36 feet bgs. This was the only soil boring with PCE levels above the PRG. Of the three monitoring wells installed, MW-2 was the only one containing PCE in groundwater at concentrations greater than 1 $\mu\text{g}/\text{L}$. PCE was reported at a maximum concentration of 5,300 $\mu\text{g}/\text{L}$ in this well in July 2003 (Tetra Tech 2004).

In 2005, a hydrogeologic investigation was conducted at the site by personnel from the EPA Environmental Response Team (ERT) and the Response Engineering and Analytical Contract (REAC) (Lockheed Martin Technology Services 2005). The primary purpose of the investigation was to define the nature and extent of groundwater contamination upgradient of the municipal well field in order to assess the applicability of installing a permeable reactive barrier (PRB) for groundwater treatment and protection. As part of the investigation, six boreholes were installed about 150 feet upgradient (south) of contaminated AMU Well No. 7 at the approximate centerline of the proposed PRB wall. Borehole depths ranged from 76 to 87.5 feet bgs, and were installed into the upper sandstone bedrock using sonic drilling techniques. Multiple groundwater samples were collected at each boring, beginning at about 20 to 25 feet bgs, and then at 20-foot intervals as the borings were advanced. A total of 28 groundwater samples were collected. PCE was reported in water samples from all six borings, with the highest concentration (446 $\mu\text{g}/\text{L}$) found in the boring farthest east (Lockheed Martin Technology Services 2005). The eastern extent of the plume near the well field was not delineated in that investigation, and remains undefined. Following the investigation, preliminary cost estimates to install a PRB were calculated. The total costs for this remedial technology were prohibitive to implement under the removal program.

ENVIRONMENTAL SETTING

Sources of groundwater in the area of Cass County include alluvial valley aquifers, glacial-drift aquifers, and the Dakota Formation (U.S. Geological Survey [USGS] 1992). The alluvial aquifers are primarily made up of deposits along existing river valleys. The nearest alluvial valley to Atlantic is the east fork of the Nishnabotna River and its tributary, Troublesome Creek. The aquifer underlying the valley is relatively shallow, with an average depth of 21 feet, and is comprised of fine-grained alluvial deposits. The thickness ranges from approximately 2 to 43 feet. Groundwater can also be obtained from shallow glacial-drift aquifers consisting of glacial and loess deposits over bedrock. In the Atlantic area, these deposits range in thickness from 18 to 260 feet. Although the water table is usually shallow, production rates in the glacial-drift aquifers are often limited due to low soil permeability. Neither the alluvial nor the glacial drift aquifers are used for groundwater production in the Atlantic area.

The City of Atlantic draws its water solely from the Nishnabotna Member of the Dakota Formation. The Dakota is a fine- to coarse-grained sandstone, very poorly cemented (friable), part pebbly to conglomeratic, and locally interbedded with seams of clay (IDNR 1996). Secondary lithologies include chert-quartz gravel, conglomerate, and gray to variegated mudstone with some siderite pellets. The formation is approximately 40 to 60 feet thick in the Atlantic wellhead protection area, providing abundant pore space for groundwater storage. Within the wellhead protection area, the Dakota is upwardly confined by clay-rich glacial till.

The aquifer is recharged by downward percolation through Pleistocene deposits and by lateral groundwater inflow from southwest Minnesota. Regional groundwater flow is from north to south, and natural discharge from the aquifer occurs into the lower reaches of major rivers in the region. Locally, groundwater flows from south to north (the direction of PCE migration), which results from a combination of topography and groundwater pumping from the municipal well field.

Average hydraulic characteristics of the Dakota Formation in the wellhead protection area are as follows (USGS 1992):

- Transmissivity = 1,750 to 3,075 square feet per day
- Hydraulic conductivity = 35 to 60 feet per day
- Hydraulic gradient = 0.003 feet per foot.

Below the Dakota is an aquiclude of impermeable, calcareous, gray-blue-red shales, with interbedded limestones, belonging to the Missourian Series of Pennsylvanian age. These shales are encountered at a depth of 85 to 90 feet bgs and are approximately 725 feet thick in the Atlantic area.

SAMPLING STRATEGY AND METHODOLOGY

The sampling activities are tentatively scheduled to begin in November 2011, and will require approximately 3 days to complete. The laboratory data obtained for all samples collected during this project will be compared to benchmarks provided in the Superfund Chemical Data Matrix (SCDM) to assess whether further response is warranted.

Groundwater Sampling

Groundwater samples will be collected from three existing monitoring wells (including one sidegradient location) and the 10 Atlantic municipal wells (see Appendix B, Figure 2).

The monitoring wells will be gauged with a water level indicator prior to sampling. Temperature, pH, specific conductivity, and turbidity shall be monitored and recorded during purging. Purging shall continue until these parameters have stabilized (until a difference of less than 0.2 pH units and less than a 10 percent change for all other parameters is observed among three consecutive readings). The groundwater samples will be collected after bailing or pumping (using an electric submersible pump) a minimum of three well volumes of water from each monitoring well. Water samples submitted for VOCs analysis will be collected in four 40-milliliter vials and preserved with hydrochloric acid (HCl) to a pH <2.

For the municipal wells, untreated groundwater samples will be collected from taps/spigots located nearest the wellheads, prior to any treatment systems. The system lines at active wells will be purged for approximately 5 minutes before the samples are collected. Any well not currently in use will be purged for at least 15 minutes prior to sampling. Water quality parameters (pH, conductivity, and temperature) will be recorded after each well has been purged for the designated time. Municipal well samples will be collected into three 40-milliliter vials preserved with HCl for analysis for drinking water level volatile organic compounds (VOC).

A field sheet will be completed for each groundwater sample location. The field sheets will include the following information: water quality parameters, purge times, estimated purge volumes, exact sample locations, and analyses to be performed. The groundwater samples will be submitted to the EPA Region 7 laboratory to be analyzed for VOCs. All water samples will be stored in coolers maintained at temperatures at or below 4 degrees Celsius (°C) pending submittal to the EPA Region 7 laboratory.

Quality Control Samples

To evaluate sample quality control (QC), a water trip blank, rinsate blank, and field blank will be collected, as specified in Section 2.5 of the QAPP form. In addition, one field duplicate will be collected from MW-2, and one field duplicate will be collected from AMU Well No. 6.

ANALYTICAL METHODS

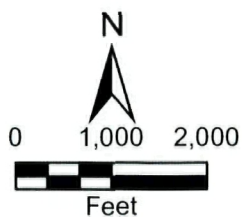
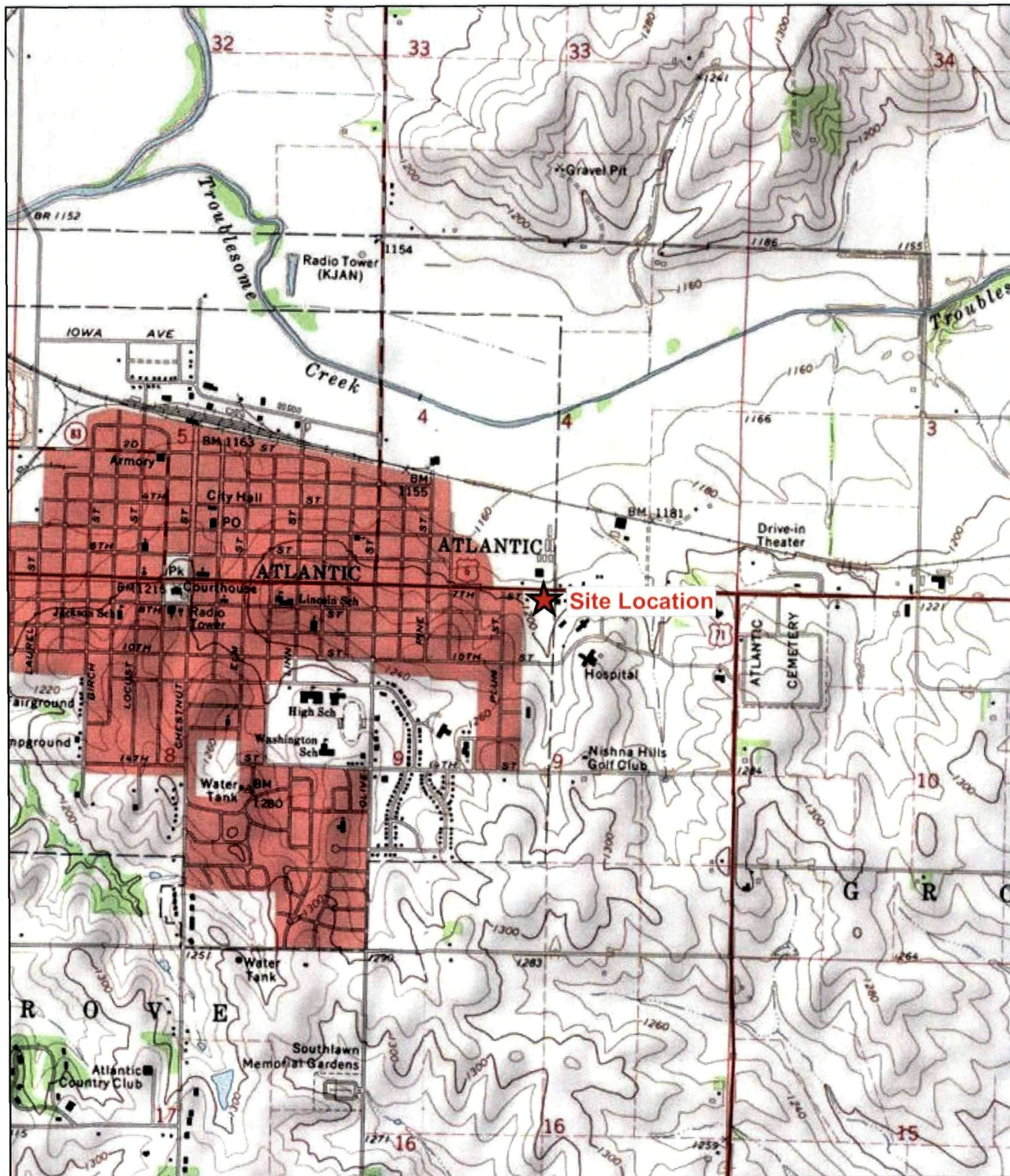
Water samples will be submitted to the EPA Region 7 laboratory in Kansas City, Kansas, for analysis. The samples will be analyzed for VOCs in accordance with Standard Operating Procedures (SOPs) and methods referenced in the QAPP. Standard turnaround times and detection limits for those methods will be adequate for this project. Appropriate containers and physical/chemical preservation techniques will be employed during the field activities to help verify that representative analytical results are obtained. An Analytical Services Request form will be completed by the Tetra Tech START Project Manager and submitted to the EPA Region 7 laboratory. Submittal of samples to the laboratory is expected in November 2011.

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- U.S. Geological Survey (USGS). 1992. Availability and Water Quality of Water from the Alluvial, Glacial-Drift, and Dakota Aquifers and Water Use in Southwest Iowa. USGS Water Resources Investigation Report 91-4156.

APPENDIX B

FIGURES



Atlantic Water Supply Site
Atlantic, Iowa

Figure 1
Site Location Map

TETRA TECH EM INC.

Source: USGS Atlantic, Iowa 7.5 Minute Topo Quad, 1991
USGS Wota, Iowa 7.5 Minute Topo Quad, 1971

Date: 10/18/2011

Drawn By: Bill Spiking

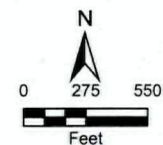
Project No: X9004 L 11 0258 000



Legend

Proposed Sample Locations

- Monitoring well location
- Public water supply well location
- Streets
- Major roads
- City boundary
- Dry cleaner location



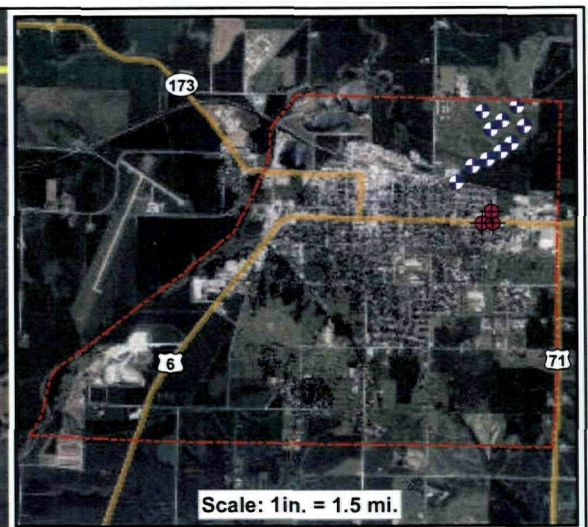
Source: Bing Maps Aerial Imagery Web Mapping Service, 2011

Atlantic Water Supply Site
Atlantic, Iowa

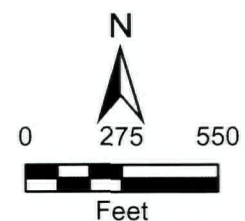
Figure 2
Sample Location Map

TETRA TECH EM INC.

Date: 10/16/2011 Drawn By: Bill Spiking Project No: X8004.L11.0258.000



- Legend
- Proposed Sample Locations
- Monitoring well location
 - Public water supply well location
 - Streets
 - Major roads
 - City boundary
 - Dry cleaner location



Source: Bing Maps Aerial Imagery Web Mapping Service, 2011

Atlantic Water Supply Site
Atlantic, Iowa

Figure 2
Sample Location Map

TETRA TECH EM INC.